Project Introduction

Spacecraft missions are more commonly entering highly dynamic environments, such as lunar libration orbits, orbits about small bodies, and orbits driven by low-thrust propulsion. Advanced Space proposes to develop a robust navigation filter optimized for each of these highly dynamic environments. Further, the tool will be designed to be open-source and work with tools such as NASA's General Mission Analysis Tool (GMAT). The dynamic filter will implement state-of-the-art process noise strategies tuned for dynamic environments. These process noise strategies, combined with an extended Kalman filter, will permit the filter to operate on very long arcs without resets, to operate on unstable trajectories, and to operate on trajectories propagated in undetermined systems, such as in the vicinity of an uncharacterized asteroid. The filter will estimate unmodeled accelerations, tuned to be sensitive to the uncertainties present in each of these highly dynamic environments.

Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
Advanced Space, LLC	Lead Organization	Industry	Boulder, Colorado
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

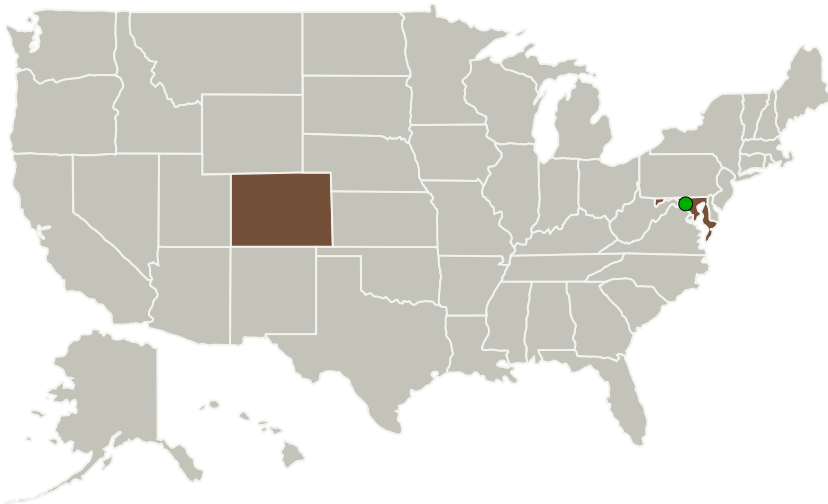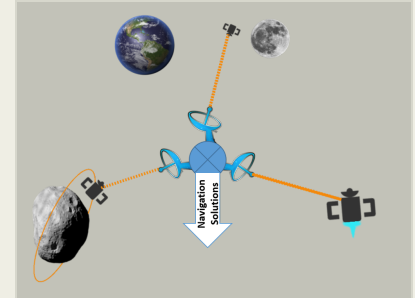Improved Navigation for Highly Dynamic Environments, Phase I

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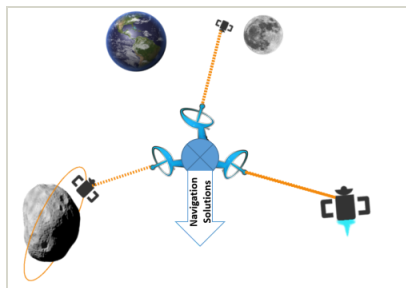| Primary U.S. Work Locations	
Colorado	Maryland

Project Transitions

▶ **June 2015:** Project Start

✔ **December 2015:** Closed out

Closeout Summary: Improved Navigation for Highly Dynamic Environments, Phase I Project Image

Closeout Documentation:
- Final Summary Chart Image*(https://techport.nasa.gov/file/139099)*

Images

Briefing Chart Image
Improved Navigation for Highly Dynamic Environments, Phase I *(https://techport.nasa.gov/image/133705)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Space, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:
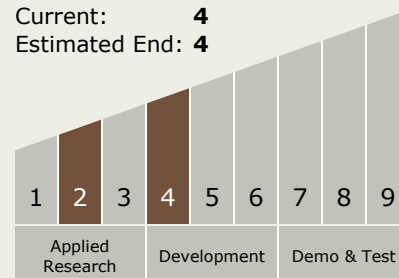
Carlos Torrez

Principal Investigator:

Jeffrey Parker

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  └ TX05.4 Network Provided Position, Navigation, and Timing
    └ TX05.4.2 Revolutionary Position, Navigation, and Timing Technologies

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System